

Serial No. 10/725,021
Reply to Office Action of August 10, 2005

Docket No. DPO-0008

Amendments to the Drawings:

The attached drawings includes changes to Fig. 1-4. These sheets, which includes Figs. 1-4, replaces the original sheets including Figs. 1-4. In Figures 1-4, the label "Prior Art" has been added.

Attachment: Replacement Sheets (2 Sheets)
Annotated Sheets Showing Changes (2 Sheets)

REMARKS

Initially, in the Office Action dated August 10, the Examiner has objected to the drawings and requested that Figures 1-4 be designated by a legend such as "Prior Art". Further, the disclosure has been objected to because of informalities. In addition, claim 25 has been objected to because of informalities. Claim 19 has been rejected under 35 U.S.C. §112, second paragraph.

Further Claims 1-3 and 14 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,808,442 (Kaite et al.). Claims 5-8 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,387,332 (Oyamada) in view of U.S. Patent No. 6,160,377 (Fujii). Claims 9 and 10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Oyamada in view of U.S. Patent No. 6,777,913 (You). Claims 11-13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Oyamada in view of Fujii and further in view of Kate. Claims 15-24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Kate in view of U.S. Patent No. 5,637,979 (Tamai). Claim 25 has been rejected under 35 U.S.C. §103(a) as being unpatentable over the prior art in view of U.S. Patent No. 5,539,297 (Fiebig). Claims 26, 27, 29, and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the prior art in view of Fiebig and further in view of Kaite et al.. Claim 28 has been rejected under 35 U.S.C. §103(a) as being unpatentable over the prior art in view of Fiebig and further in view of You.

By the present response, Applicants have amended Figs. 1-4 and claims 1, 5, 14, 19-23

and 25 to further clarify the invention. Claims 1-31 remain pending in the present application.

Drawing objections

The Examiner has objected to Figures 1-4 indicating that they should be designated by a legend such as "Prior Art". Applicants have complied with this request in the amended figures being submitted concurrently with this response and respectfully request that these objections be withdrawn.

Specification objections

The disclosure has been objected to because of informalities. Applicants have amended the specification to further clarify the invention and respectfully request that these objections be withdrawn.

Claim objections

Claim 25 has been objected to because of informalities. Applicants have amended this claim to further clarify the invention and respectfully request that this objection be withdrawn.

35 U.S.C. §112 rejections

Claim 19 has been rejected under 35 U.S.C. §112, second paragraph. Applicant has amended this claim to further clarify the invention and respectfully request that this rejection be withdrawn.

35 U.S.C. §102 rejections

Claims 1-3 and 14 have been rejected under 35 U.S.C. §102(b) as being anticipated by Kaite et al. Applicants respectfully traverse these rejections.

Kaite et al. discloses charging a plurality of lithium ion rechargeable batteries where if another battery is attached during battery charging, open circuit voltages of those respective batteries are measured and compared. When the open circuit voltage of the battery attached later is greater than that of the battery being charged, charging of the previously attached battery is suspended and the battery attached later is given priority and charged. When the open circuit voltage of the battery being charged is greater than that of the battery attached later, the battery being charged is given priority and charged.

Regarding claims 1 and 14, Applicants submit that Kaite et al. does not disclose or suggest the limitations in the combination of each of these claims of, *inter alia*, resuming charging of the first battery until one of a charging current is less than a reference current or the charging current is less than a limit indicating a state of full charge, or resuming charging of the second battery until one of the charging current is less than the reference current or the charging current is less than the limit current indicating the state of full charge, or stopping charging of the first battery based on a second charging voltage/current characteristic of the first battery, or complete charging of one of the first battery or the second battery based on the voltage/current characteristic of the one of the first battery or the second battery.

The Examiner asserts that Kaite et al. discloses resuming charging of the first battery until one of a charging current is less than a reference current and the charging current is less than a limit current indicating a state of full charge at column 2, lines 55-58. However, these portions of Kaite et al. merely disclose that lithium ion rechargeable batteries are not charged to full

charge one after another but, when a battery has been charged to 80% of full charge, charging is temporarily interrupted and the next battery is charged again to a 80% of full charge, and after all batteries have been charged to 80% of full charge, all the batteries are connected in parallel and charged with constant current and constant voltage. This is not resuming charging of a first battery until one of a charging current is less than a reference current or the charging current is less than a limit current indicating a state of full charge, as recited in the claims of the present application. These portions of Kaite et al. merely relate to charging each battery only up to 80% of full charge and then once they have all been charged to 80% of full charge, connecting them in parallel and charging them all together. These portions of Kaite et al. do not disclose or suggest anything related to a reference current, or a limit current indicating a state of full charge. Further, these portions do not disclose or suggest resuming charging of a battery until a charging current is less than the reference current or the charging current is less than a limit current indicating a state of full charge.

Similarly, the Examiner asserts that the same portions of Kaite et al. disclose resuming charging of a second battery until one of a charging current is less than a reference current and the charging current is less than a limit current indicating a state of full charge. However, as has been noted, these portions do not disclose or suggest these limitations in the claims of the present application.

The Examiner further asserts that Kaite et al. discloses stopping charging of the first battery based on a second charging voltage/current characteristic of the first battery at column 2,

lines 19-23. However, these portions of Kaite et al. merely disclose that when another lithium ion rechargeable battery is attached to the battery charger while a battery is being charged, battery charging is interrupted, and the charge of the battery being charged and the battery attached later are sensed and compared. The battery is sensed by measuring its open circuit voltage. This is not stopping charging of the first battery based on a second charging voltage/current characteristic of the first battery, as recited in the claims of the present application. These portions of Kaite et al. merely relate to interrupting battery charging when another battery is attached. This is not stopping charging based on a second charging voltage/current characteristic of the first battery.

Moreover, the Examiner asserts that Kaite et al. discloses complete charging of one of the first battery or the second battery based on the voltage/current characteristic of the first battery or the second battery at column 7, lines 48-51. However, these portions of Kaite merely disclose that all batteries which have been charged to the specified voltage are connected in parallel and further charged by constant current and constant voltage charging until full charge is reached. This is not complete charging of one of the first battery or the second battery based on the voltage/current characteristic of the first battery or the second battery, as recited in the claims of the present application. Kaite et al. discloses charging of all batteries. Further this charging is performed by constant current and constant voltage charging, and is not done based on characteristics of the first battery or the second battery.

Regarding claims 2 and 3, Applicants submit that these claims are dependent on

independent claim 1 and, therefore, are patentable at least for the same reasons noted previously regarding this independent claim. For example, Applicants submit that Kaite et al. does not disclose or suggest where the reference voltage is between approximately 70% and approximately 80% of a full charging voltage, or where the reference current is a current value at a time of approximately 80% of a full charging voltage.

Accordingly, Applicants submit that Kaite et al. does not disclose or suggest the limitations in the combination of each of claims 1-3 and 14 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

35 U.S.C. §103 Rejections

Claims 5-8 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Oyamada et al. in view of Fujii. Applicants respectfully traverse these rejections.

Oyamada et al. discloses a charging apparatus that charges a plurality of rechargeable batteries individually and in succession. Each of the plurality of rechargeable batteries is connected to one corresponding charging branch. The charging apparatus comprises a charging completion circuit for detecting a charging completion of a rechargeable battery now in a charging operation, a high voltage detecting circuit for detecting an abnormal voltage of a charging branch now in a charging operation, wherein a single pulse is generated responsive to the outputs of the charging completion detecting circuit and the abnormal voltage detecting circuit.

Fujii discloses a battery charging device which charges a plurality of batteries including a charging part which supplies a charging current, and a control part which controls the charging parts so that the batteries are serially charged one by one and a supplemental charge to the batteries is then performed in parallel. The control part calculates a charged capacity for a first one of the batteries and thus determines a timing in which serial charge is switched to a second one of the batteries on the basis of the charged capacity.

Regarding claim 5, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of this claim of, *inter alia*, resumed charging a first battery of the plurality of batteries until a charging current of the first battery is less than a reference current, or further resuming charging of the first battery until the charging current of the first battery is less than a limit current indicating a state of full charging. The Examiner admits that Oyamada et al. does not disclose or suggest these limitations but asserts that Fujii discloses these limitations in column 11, lines 20-51. However, these portions of Fujii merely disclose that the battery pack A is continuously charged until a charged capacity percentage reaches larger than or equal to 90%, where the percentage is based on a ratio of the integrated value of the charging current to the total integrated value of the charging current for the battery pack A, and that once the condition is satisfied, the controller stops the serial charge to the battery pack A. This is not resuming charging a first battery of the plurality of batteries until a charging current of the first battery is less than a reference current, as recited in the claims of the present application. These portions

of Fujii merely disclose the calculation performed by the controller of the battery charging device that includes calculating a charge capacity of the battery pack and determining whether the ratio calculated exceeds 90% to thereby stop charging the battery pack. In contrast, the limitations in the claims of the present application relate to charging each of a plurality of batteries until a charging voltage of each of the batteries becomes a reference voltage, and then continuing to charge a first battery of the plurality of batteries until the charging current of the first battery is less than a reference current. Fujii does not disclose or suggest anything related to resuming charging of a first battery, or a reference current.

Further, the Examiner admits that Oyamada et al. does not disclose or suggest resuming charging of the battery until the charging current of the first battery is less than a limit current indicating a full charge but asserts that Fujii discloses these limitations in column 11, lines 52-57. However, these portions of Fujii merely disclose that the controller calculates the charge capacity and determines the timing at which the charging operation is switched from the battery pack A to the battery pack B. This is not further resuming charging of the first batteries until the charging current of the first battery is less than a limit current indicating a state of full charging. As noted previously, the controller has already determined that the battery pack A is charged, and this additional disclosure in Fujii merely relates to the controller determining to switch from battery pack A to battery pack B. In contrast, the limitations in the claims of the present application relate to further resuming charging of the first battery. These limitations are neither disclosed nor suggested in Fujii.

Regarding claims 6-8, Applicants submit that these claims are dependent on independent claim 5 and, therefore, are patentable at least for the same reasons noted regarding this independent claim. For example, Applicants submit that none of the cited references disclose or suggest resume charging of the second battery until a charging current of the second battery is less than a reference current, or further resuming charging of the second battery until the charging current of the second battery is less than a limit current indicating a state of full charge.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of each of claims 5-8 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

Claims 9 and 10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Oyamada in view of You. Applicants respectfully traverse these rejections. You discloses an apparatus and method that reduces charging time of a multi-battery with a plurality of battery units. A charging processes and apparatus charges a first battery unit of a multi-battery, keeps checking whether a current charging the first battery unit reaches a prescribed value, selects and charges a selected second battery unit of the multi-battery along with the first battery unit if the preset value is reached, and charges the second battery unit with a limited maximum magnitude current when the first battery unit is completely charged.

Regarding claims 9 and 10, Applicants submit that these claims are dependent on independent claim 5 and, therefore, are patentable at least for the same reasons noted previously

regarding this independent claim. Applicants submit that You does not overcome the substantial defects noted previously regarding Oyamada. For example, Applicants submit that none of the cited references disclose or suggest resume charging of the second battery until a charging current of the third battery is less than a reference current, or further resuming charging of the second battery until the charging current of the third battery is less than a limit current indicating a state of full charge.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of each of claims 9 and 10 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

Claims 11-13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Oyamada et al. in view of Fujii and further in view of Kaite et al. Applicants respectfully traverse these rejections and submit that these claims are dependent on independent claim 5 and, therefore, are patentable at least for the same reasons noted previously regarding this independent claim. Applicants submit that Kaite et al. does not overcome the substantial defects noted previously regarding Oyamada et al. and Fujii. For example, Applicants submit that none of the cited references disclose or suggest where the reference voltage is between approximately 70% and approximately 80% of a full charging voltage, or where the reference current is a current value at a time of approximately 80% of a full charging voltage, or where the limit current is a current value at a time of approximately 95% of a state of a full charging voltage.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose suggest or render obvious the limitations in the combination of each of claims 11-13 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

Claims 15-24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Kaite et al. in view of Tamai et al. Applicants respectfully traverse these rejections.

Tamai et al. discloses a plurality of series connected rechargeable batteries that are charged by detecting battery voltages and controlling charging current. Normal charging is performed until any one battery voltage reaches a prescribed voltage. After any one battery voltage reaches the prescribed voltage, all batteries are charged such that a charging current is controlled to keep each battery voltage from exceeding the prescribed voltage.

Regarding claims 15-24, Applicants submit that these claims are dependent on independent claim 14 and, therefore, are patentable at least for the same reasons noted previously regarding this independent claim. Applicants submit that Tamai et al. does not overcome these substantial defects noted previously regarding Kaite et al. For example, Applicants submit that none of the cited references disclose or suggest where the charging voltage/current characteristic has one of a voltage gradient and a current gradient according to a charging voltage/current of the first battery, or where when said voltage of said first battery gradually rises, said current goes to a constant current and then said current gradient goes to substantially zero, thereby said voltage of said first battery having a predetermined gradient, and

wherein when said first battery is charged by some degree of charging, said current drops, said current gradient has a negative value, and then said first battery has a constant voltage zone, thereby said voltage of said voltage gradient being substantially zero, or wherein in said first battery charging, said voltage gradient of said first battery is not more than zero, and a charging voltage of said first battery is not more than approximately 4.0V, and wherein if said voltage gradient is not more than zero and said charging current is more than approximately 100mA and not less than approximately 200mA, then said first battery is charged and said second battery is not charged.

Accordingly, Applicants submit that none of the cited references, taken alone or in proper combination, disclose, suggest or render obvious the limitations in the combination of each of claims 15-24 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

Claim 25 has been rejected under 35 U.S.C. §103(a) as being unpatentable over the prior art in view of Fiebig. Applicants respectfully traverse this rejection.

Fiebig discloses a charging device for charging a plurality of rechargeable batteries that includes at least two sensors associated with each rechargeable battery for measuring a measurable parameter, e.g. voltage, temperature, etc, of the rechargeable battery associated therewith; switchable devices for electrically connecting one or more rechargeable batteries at a time for charging; and a control device for selecting rechargeable batteries for charging in an

order determined by measured values of the measurable parameters obtained from the sensors associated with each rechargeable battery.

Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of claim 25 of, *inter alia*, a control circuit to control operations of the first circuit and the second circuit such that the first battery and the second battery are alternately charged and such that the first battery is charged based on charging voltage/current characteristics of the first battery and the second battery is charged based on charging voltage/current characteristics of the second battery.

Applicants are confused as to the Examiner's rejection asserting that Figure 5 is Prior Art since Figure 5 in Applicants' specification is clearly an embodiment of the present invention. In any event, the Examiner admits that the prior art Figure 5 does not disclose or suggest a control circuit to control operations of the first circuit and the second circuit but asserts that Fiebig discloses these limitations in Figure 1 item 5, Figure 2 and column 3, line 52 and column 4, lines 19-22. However, these portions of Fiebig merely disclose a control unit that controls switch devices in a device for charging a group of rechargeable batteries, a graphical illustration of a voltage and timing graph showing sequential charging of rechargeable batteries, that additional sensors such as a current sensor or a pressure sensor are used to measure other battery parameters, and that the switching circuit controls the indicators associated with the battery chambers for showing measured values such as battery voltage and temperature. This is not a control circuit to control operations of a first circuit and a second circuit such that the first

battery and the second battery are alternately charged and such that the first battery is charged based on charging voltage/current characteristics of the first battery and the second battery is charged based on charging voltage/current characteristics of the second battery, as recited in the claims of the present application. Fiebig merely discloses that individual battery chambers of the charging device are switched on in a sequential manner depending on whether a battery exists in the battery chamber or not. Fiebig does not disclose or suggest anything related to charging a first battery based on charging voltage/current characteristics of the first battery, or charging a second battery based on charging voltage/current characteristics of the second battery. Fiebig merely discloses charging a plurality of batteries in the same way based on whether a battery is present in the battery chamber, where the batteries present in the battery chambers are charged in a sequential manner.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of claim 25 of the present application. Applicants respectfully request that this rejection be withdrawn and that this claim be allowed.

Claims 26, 27, 29, and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Fiebig in view of Kaite et al. Applicants respectfully traverse these rejections and submit that these claims are dependent on independent claim 25 and, therefore, are patentable at least for the same reasons noted previously regarding this independent claim. Applicants submit that Kaite et al. does not overcome these substantial defects noted previously

regarding Fiebig. For example, Applicants submit that none of the cited references disclose or suggest where the charging voltage/current characteristics relate to a reference voltage, or where the reference voltage is between approximately 70% and approximately 80% of a full charging voltage.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest, or render obvious the limitations in the combination of each of claims 26, 27, 29 and 30 of the present application. Applicants respectfully request that these rejections be withdrawn and that these claims be allowed.

Claim 28 has been rejected under 35 U.S.C. §103(a) as being unpatentable over the prior art in view of Fiebig and further in view of You. Applicants respectfully traverse this rejection and submit that this claim is dependent on independent claim 25 and, therefore, is patentable at least for the same reasons noted previously regarding this independent claim. For example, Applicants submit that none of the cited references disclose or suggest where the charging voltage/current characteristics relate to a reference current.

Accordingly, Applicants submit that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of claim 28 of the present application. Applicants respectfully request that this rejection be withdrawn and that these claims be allowed.

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Conclusion

In view of the foregoing amendments and remarks, Applicants submit that claims 1-31 are now in condition for allowance. Accordingly, early allowance of such claims is respectfully requested. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney, **Frederick Bailey**, at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
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Please direct all correspondence to Customer Number 34610

Fig. 1

PRIOR ART

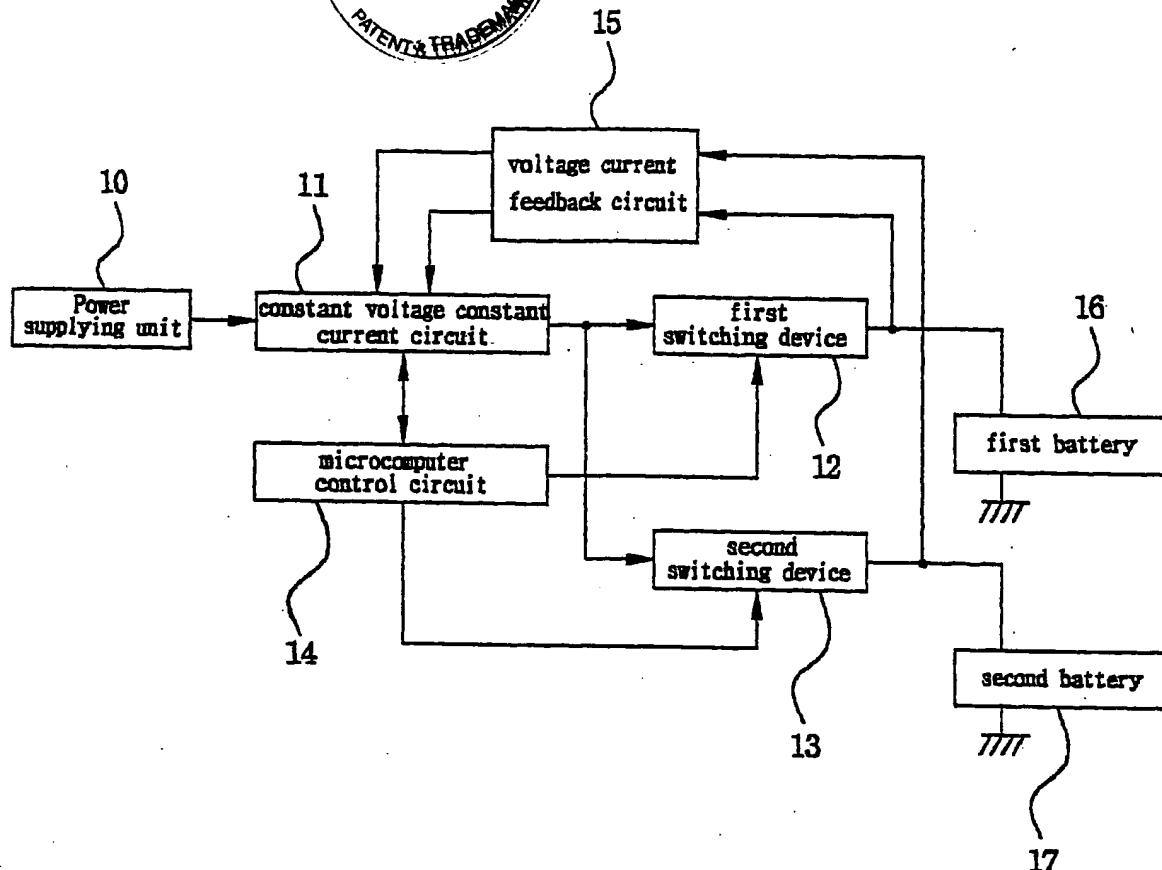


Fig. 2

PRIOR ART

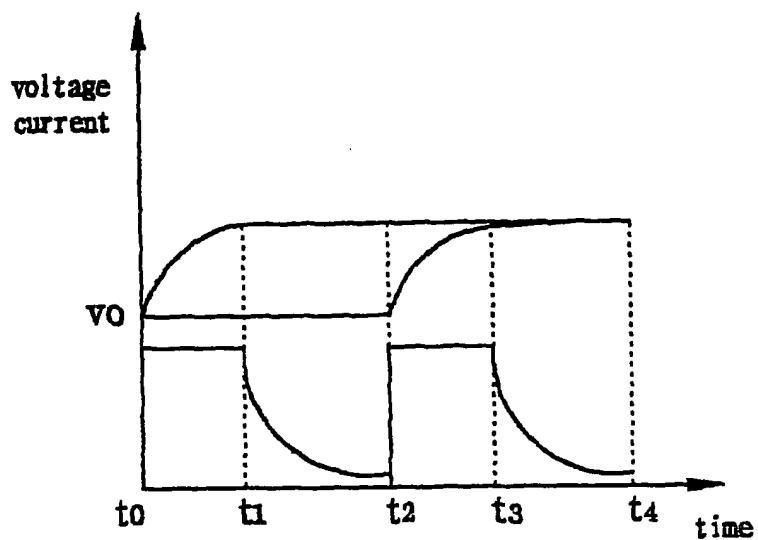


Fig. 3

PRIOR ART

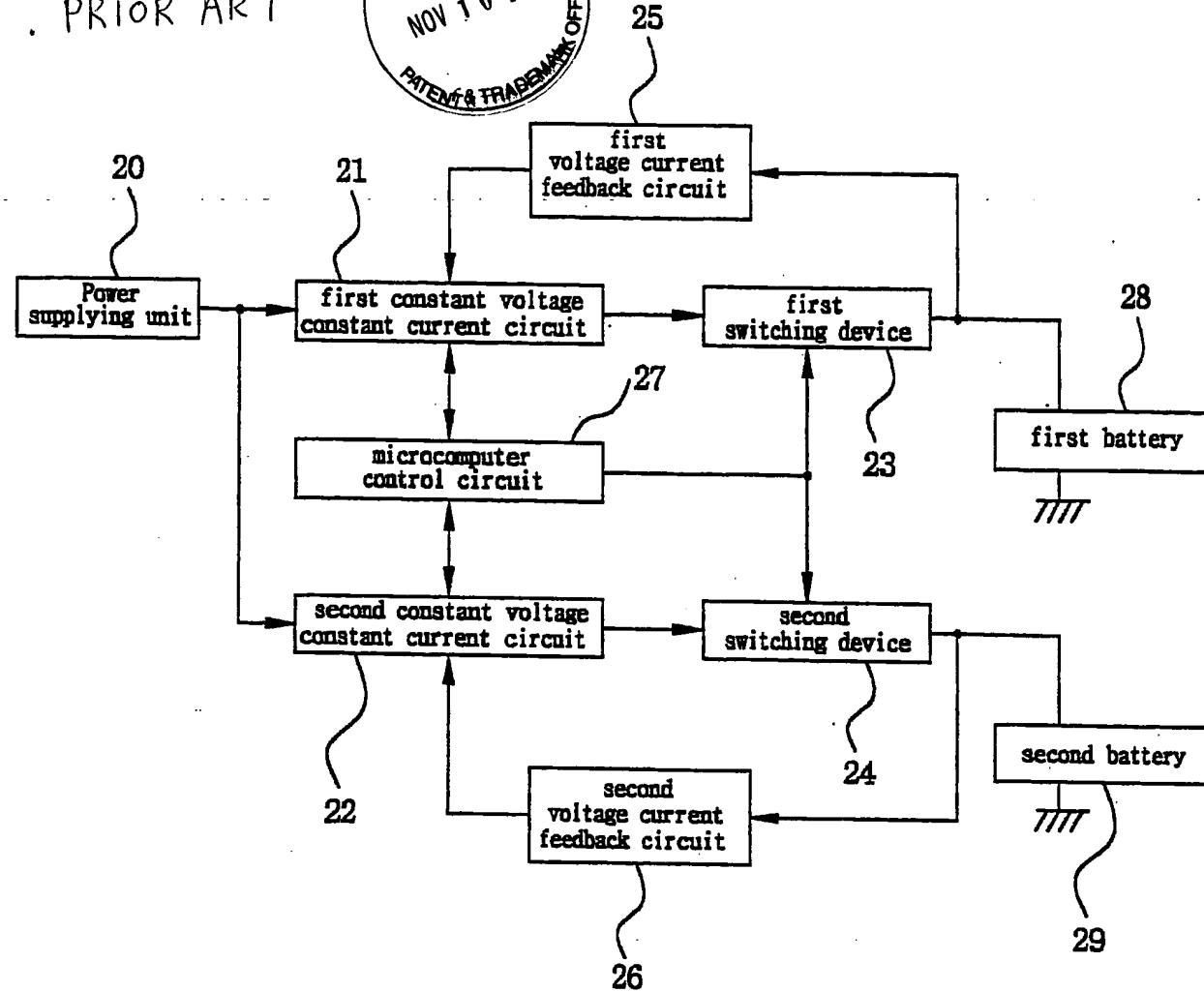


Fig. 4

PRIOR ART

